

Appl. No. 10/801,987
Amdt. Dated **August 17, 2007**
Reply to Office Action of April 18, 2007

Attorney Docket No. 81872.0057
Customer No.: 26021

REMARKS/ARGUMENTS:

Minor changes are made to this specification. Claims 1-4 and 13-22 are canceled without prejudice. Claims 5-12 are amended. New claims 23-33 are added. Support for the amendment to independent claim 5 and new independent claim 25 can be found in Fig. 2 and at p. 23, line 10-p. 25, line 18 of Applicant's specification. Claims 5-12 and 23-33 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The present invention relates to a solar cell element with electrodes coated with solder. The present invention also relates to a solar cell module comprising a plurality of solar cell elements connected to one another by means of connection electrodes. (Applicant's specification, at p. 1, lines 7-12).

SPECIFICATION:

The Office states that the disclosure is objected to because of the following informalities: several misspellings and/or typographic errors were noticed. (e.g., "non-light receivig surface" on page 19 should be replaced by "non-light receiving surface"). In response, Applicant amended the specification to correct the typographical error listed above. Withdrawal of this objection is thus respectfully requested.

CLAIM OBJECTIONS:

Claims 3 and 4 are objected to because of minor typographical errors. This objection is moot due to the cancellation of these claims.

Claim 6 is objected to because of a logical error and/or misuse of vocabulary. The Office objects to the manner in which the relationship between the "elements"

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is presented and the use of the word “temporally.” In response, Applicant amended claim 6 to read: The method for producing a solar cell module according to claim 5, wherein the first solder layer has a higher melting point than the second solder. Applicant respectfully submits that there are no logical errors and/or misuses of vocabulary in claim 6, as currently amended. Withdrawal of this objection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102:

Claim 1 stands rejected under 35 U.S.C. § 102(b) as being unpatentable over Tsuzuki et al. (U.S. Patent no. 6,479,744 B1). This rejection is moot due to the cancellation of claim 1.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 2-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki as applied to claim 1 in view of Nakahara et al. (JP Patent Application Publication 2002-346788). This rejection is moot due to the cancellation of these claims.

Claims 5 and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki in view of Sakamoto (JP Patent Application Publication 2000-114416). Applicant respectfully traverses this rejection as to the amended claims. Claim 5, as amended, is as follows:

A method for producing a solar cell module comprising:
a step for providing a plurality of solar cell elements each having
a front surface electrode formed on a light-receiving surface of a
semiconductor substrate thereof, and a back surface electrode formed
on a non-light receiving surface of the semiconductor substrate;

a step for connecting a first connection tab to the front surface electrode of one of the solar cell elements, through a first solder layer;

a step for connecting a second connection tab to the back surface electrode of another of the solar cell elements, through a second solder layer having a different melting point than the first solder layer; and

a step for connecting the first connection tab to the second connection tab.

Applicant respectfully submits that the cited references cannot render claim 5 obvious, because the cited references fail to teach or suggest “a step for connecting a first connection tab to the front surface electrode of one of the solar cell elements, through a first solder layer; a step for connecting a second connection tab to the back surface electrode of another of the solar cell elements, through a second solder layer having a different melting point than the first solder layer.”

Claim 5 is a method for producing a solar cell module that comprises providing a plurality of solar cell elements. A front surface electrode 3 of the solar cell element is connected to a first connection tab 5 (Fig. 2a), and a back surface electrode 8 of another solar cell element is connected to a second connection tab 9 (Fig. 2b), and these connection tabs are connected (Fig. 2c). A first solder layer that connects the first connection tab 5 to the front surface electrode 3, and a second solder layer that connects the second connection tab 9 to the back surface electrode 9 have different melting points.

The Office cites Tsuzuki for disclosing a solar cell module comprising solar cell elements that contain a semiconductor substrate, a surface electrode formed on a light-receiving surface of the semiconductor substrate and a back surface electrode formed on a non-light receiving surface of the semiconductor substrate; connection tabs for interconnecting the surface electrode on the light-receiving

surface and the back surface electrode on the non-light receiving surface of the solar cell elements, and that the connection tabs are fixed to each of the electrodes via two layers of solder. (Office Action, at p. 6, lines 6-21). The Office acknowledges that Tsuzuki fails to teach that the first solder layer for connecting the surface electrode to the connection tab on the light-receiving surface and a second layer for connecting the back surface electrode to the connection tab on the non-light receiving surface have different melting points. (Office Action, at p. 6, line 21-p. 7, line 2). Instead, the Office cites Sakamoto for supplying this teaching.

However, in Sakamoto, a plurality of solders C is disposed only on the first surface Ba of the main body B. The plurality of the solders C have different melting points. A solder disposed on a central portion and a solder disposed on a peripheral portion are connected to the electrode pad 11 simultaneously when the plurality of the solders C are connected to the electrode pad 11 of the wire substrate 10. The central portion is heat-conductive, and the peripheral portion is less heat-conductive.

In contrast, in the present invention, on the first plane of the solar cell element, the melting point of the first solder layer that connects the first connection tab to the front surface electrode is different than the melting point of the second solder layer that connects the back surface electrode to the second connection tab on the second plane of the solar cell element. The arrangement of the present invention has the advantageous effect that when a second connection tab is connected, the solder used in the first connection does not melt. Thus, both the arrangement of the present invention and the results obtained are different than those of Sakamoto.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claim 5 obvious, because the cited references fail

to teach or suggest each and every claim limitation. Claim 6 depends from claim 5 and cannot be rendered obvious for at least the same reasons as claim 5. Withdrawal of this rejection is thus respectfully requested.

Claim 7 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki, Sakamoto as applied to claim 6 and in further view of Nakahara.

Claim 7 depends from claim 5 and therefore, cannot be rendered obvious over Tsuzuki and Sakamoto for at least the same reasons discussed above. Nakahara cannot remedy the defect of Tsuzuki and Sakamoto and is not relied upon by the Office for such. Instead, the Office cites Nakahara for teaching a lead-free, Sn-Ag based solder alloy that is an environmentally sound alternative to Pb-based solder while providing high joint dependability.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claim 7 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 8-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki, Sakamoto as applied to claim 5 and in further view of Okada et al. (U.S. Patent No. 6,571,469).

Claims 8-10 depend from claim 5 and therefore, cannot be rendered obvious over Tsuzuki and Sakamoto for at least the same reasons discussed above. Okada cannot remedy the defect of Tsuzuki and Sakamoto and is not relied upon by the Office for such. Instead, the Office cites Okada for teaching a soldering method for the manufacture of a modular board with multiple electrodes.

Furthermore, the through holes of Okada are different than the through holes of the present invention, in both structure and function. Okada teaches a board 101 (6) having a number of electrodes 105 on its edge (Fig. 1). Okada teaches

a method for attaching a solder ball to secure in the through hole 103 of these electrodes 105. This method, illustrated in Fig. 10, comprises mounting a split board 6 to a hole of the bare board 1, and pushing the solder ball 10 to the through holes 5 and 2. These are produced between the bare board 1 and the split board 6 (Fig. 16). Then, the split board 6 is separated from the bare board 1 and the blanking plate 7, resulting in board 101 (Fig. 19). Thus, the through hole 103 of Okada does not connect to the connection tabs, but instead serves only as a recess for mounting the solder. This is further illustrated by 21A in Fig. 26, which is a through hole provided on the member 21 for the purpose of placing the solder ball in a predetermined position, and the solder ball then passes through the hole 21A (Okada, column 16, lines 14-31).

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 8-10 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki, Sakamoto as applied to claim 5 and in further view of Mizukami et al. (U.S. Patent No. 6,369,315 B1) and Okada.

Claims 11 and 12 depend from claim 5 and therefore, cannot be rendered obvious over Tsuzuki, Sakamoto, and Okada for at least the same reasons discussed above. Mizukami cannot remedy the defect of Tsuzuki, Sakamoto, and Okada and is not relied upon by the Office for such. Instead, the Office cites Mizukami for teaching a power generation system specifically for use with an array of photovoltaic modules. The Office further cites Mizukami for teaching connecting the photovoltaic array via bus bars and the bus bars contain extensions that are connected directly to “an output fetching line” via a terminal box.

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In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 11 and 12 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 13, 15, and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and in further view of Okada. This rejection is moot due to the cancellation of these claims.

Claims 14, 16, and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki, Okada and in further view of Nakahara. This rejection is moot due to the cancellation of these claims.

Claims 19 and 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizukami in view of Okada. This rejection is moot due to the cancellation of these claims.

Claims 20 and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizukami and Okada as applied to claims 19 and 21 above and in further view of Nakahara. This rejection is moot due to the cancellation of these claims.

New dependent claims 23 and 24 depend from claim 5 and are therefore, patentable over the references discussed above for at least the same reasons as claim 5.

New independent claim 25 is a method for producing a solar cell module that comprises providing a solar cell element. A first connection tab 5 is connected to a front surface electrode 3 of the solar cell element (Fig. 2a), and a second connection tab 9 is connected to the back surface electrode 8 of the solar cell element (Fig. 2b). The melting point of a second solder layer that connects the second connection tab 9 to the back surface electrode 9 has a lower melting point than the melting point of a

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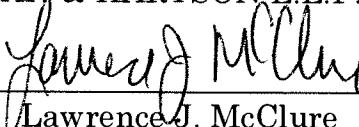
first solder layer that connects the first connection tab 5 to the front surface electrode 3.

Thus, new independent claim 25 and its dependent claims 26-33 are directed to a method that is similar to that of independent claim 5 and are therefore, patentable over the references discussed above for reasons similar to those discussed above.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4600 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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